COLLOID CHEMISTRY.

An Introduction to the Chemistry of the Colloids. A Compendium of Colloidal Chemistry for Students, Teachers, and Works Managers. By Dr. V. Pöschl. Translated from the second, enlarged, German edition by Dr. H. H. Hodgson. Pp. iv+114. (London: C. Griffin and Co., Ltd., 1910.) Price 3*s.* 6*d.* net.

THIS short work is well described in its title as a compendium of colloidal chemistry. Struck by the growing importance of this branch of chemical science, the author has endeavoured to provide a brief summary of the chief characteristic properties and modes of preparation of colloids, as well as to indicate some of the more important phenomena in the production of which colloidal substances are concerned.

The chemical methods for the preparation of colloidal solutions of the hydroxides, sulphides, and metals are described in some detail, together with the properties of the resulting hydrosols, special attention being paid to gold and silver, the study of which has done so much to advance our knowledge of the colloids. The electrical methods, due to Bredig, for the production of metallic hydrosols are also well described, whereas the precipitation methods by which colloidal solutions of sodium and barium salts have been obtained are not mentioned.

The character of the work is incompatible with much discussion of the numerous knotty points which must inevitably arise in any account of the various theories of the colloidal state, but a clear description of these theories is given, great stress being laid on the positive evidence afforded by the ultramicroscope that colloidal solutions are not homogeneous. Attention is also directed to the important fact that many substances, a list of which is given, are known both in the crystalline and colloidal forms, and that the colloidal state is not necessarily a property only of substances possessed of a large molecule and complex chemical constitution, but may also be associated with quite simple substances, the nature of solvent, or, as it is better termed, the dispersion medium, being frequently the deciding factor.

Perhaps too little stress is laid on the electrochemical relations of colloids, and the important subject of the mutual precipitation of colloids of opposite electrical sign is dismissed in a single line.

The concluding sections on the importance of colloidal chemistry in various branches of chemistry and in other sciences indicate very clearly how much assistance these are deriving from the realisation of the fact that many familiar phenomena can only be adequately understood in the light of our knowledge of the colloids.

On the whole, it may be said that the purpose of the author in compiling this account of the colloids has been fully realised, and that the reader will gain a good idea of many of the points of interest connected with this difficult and important subject.

A. HARDEN.

OUR BOOK SHELF.

An Introduction to the Study of Metallurgy. By Sir W. C. Roberts-Austen, K.C.B., F.R.S. Sixth edition, revised and enlarged by F. W. Harbord. Pp. xv+478. (London: Charles Griffin and Co., Ltd., 1910.) Price 18*s.* net.

THE appearance of a new edition of Sir William Roberts-Austen's "Introduction to the Study of Metallurgy," which has been out of print for some time, is to be heartily welcomed, as no other book adequately fills its place in metallurgical literature. Since its first publication there have been vast advances in pyrometry, metallography, and in metallurgical processes, advances which were only partially dealt with in succeeding editions. In this the sixth edition special attention has been given to the results of recent research and metallurgical progress; the chapter on pyrometry has been rewritten, a new chapter on metallography has been prepared, and in the chapter on furnaces, descriptions and illustrations of typical modern furnaces and appliances have been introduced to replace those which are no longer in general use. This chapter also contains an extremely useful account of the construction, modes of working, and uses of the three chief types of electric smelting furnaces.

A valuable addition, the thermal treatment of certain industrial alloys, has been made to chapter iv., which in previous editions was confined almost entirely to the thermal treatment of steel.

The book is intended to give a systematic course of study in the fundamental principles on which metallurgical processes are based, and the success of their various operations depend; and for this it is admirably adapted. It will be conceded by all that without this knowledge the difficulties and irregularities which arise in metallurgical practice can be, if at all, but imperfectly contended with.

The information which is given on the subjects dealt with, although necessarily brief in some cases, is set forth with remarkable clearness, and is thoroughly trustworthy and up to date.

The new edition is an excellent piece of work, and Mr. Harbord deserves the congratulations of metallurgists for having brought this valuable text-book into touch with the times. It is indispensable not only to students, but to all who are engaged in practical metallurgical work. W. G.

Untersuchungen über die Zoogeographie der Karpathen. (Unter besonderer Berücksichtigung der Coleopteren.) By Karl Holdhaus and F. Deubel. Pp. vi+202, and map. (Jena: Gustav Fischer, 1910.) Price 8 marks.

IN this important and carefully written work Prof. Holdhaus analyses chiefly the Coleoptera of the Carpathians, with special reference to the influence of the Glacial period on the Alpine fauna of Europe. We may perhaps quote a few words from his introduction to make his starting point clear, though possibly the case is a little overstated, in view of the circumpolar fauna and flora:—"During the Glacial period all life was annihilated in northern Europe. The animals at present inhabiting north Europe are post-Glacial immigrants. The remarkable impoverishment and monotony of the northern fauna—especially the absence of a typical mountain fauna in Fenno-Scandia—seems inexplicable except from this point of view. In central and southern Europe the influence of the Glacial period is chiefly visible in the mountain fauna."

Prof. Holdhaus commences by discussing the geological history of the Carpathians, and their climate and vegetation. Then he proceeds to discuss the distribution of the Coleoptera of the Carpathians, and the districts which they inhabit, the age and origin of this fauna, and how far it has been influenced by

the Glacial period, especially as compared with the fauna of the Alps. Another chapter deals with the distribution of mammals, reptiles, amphibia, mollusca, &c., in the Carpathians, followed by lists of Coleoptera (by Holdhaus and Deubel) found in different districts in the Carpathians, with notices of the surroundings. The map illustrates the glaciation of the eastern Alps and Carpathians during the Ice period, and the range of the blind mountain beetles. These beetles are a specially interesting group, of limited range, in the Austrian Alps. Some of them are cave species, while others inhabit the open.

Many interesting subjects are discussed by Prof. Holdhaus, which we have no space to allude to, but he has not forgotten to take account of fossil and amber Coleoptera, and his remarks on what he calls "Massifs de refuge" (districts south of the Alps to which he believes the mountain species retreated during the Glacial period) also seem to deserve special attention.

Mosses and Liverworts. An Introduction to their Study, with Hints as to their Collection and Preservation. By T. H. Russell. New and revised edition. Pp. xvi+211+xiii plates. (London: Sampson, Low, Marston, and Co., Ltd., 1910.) Price 4*s.* 6*d.* net.

THE speedy demand for a second issue of Mr. Russell's book testifies to its value and usefulnes as a guide to the study of mosses and hepatics. The introductory portion is all that can be desired, and the student who conscientiously masters this portion will be in a position to pass on to more advanced books dealing with the same subject. The author lays much stress on the point that he is specially anxious to use simple language, fearing that scientific words might act as a deterrent to the study. With this frequently expressed idea we do not quite agree; the true value of a scientific term consists in the fact that, when once grasped, it stereotypes the particular structure in a single word, whereas a sentence in English may convey but a very vague idea of the structure in question. As an example, the term *archegonium* defines a definite structure, which is said to be "the fruit-bearing organ," which it certainly is not. The species given as examples are well chosen, and cover all the structures peculiar to mosses and hepatics.

The detailed account of habitats, and the stress laid on their importance, are features to be commended, as too frequently the student is encouraged to snatch a fragment from anywhere, put it into a tube containing methylated spirit, and only commence serious study when viewing it under a compound microscope. The chapters on collecting, storing, and the preparation of mounted specimens for microscopic work are very full, and are obviously the outcome of much practical experience.

Thirteen whole plates of excellent figures add much to the value of the book, which can be confidently recommended as a stepping-stone to the study of mosses and hepatics.

The Social Guide, 1911. Edited by Mrs. Hugh Adams and Edith A. Browne. Pp. xxxviii+252. (London: A. and C. Black, 1911.) Price 2*s.* 6*d.* net.

INFORMATION is given in this work of reference not only about occupations for leisure days and hours, but also concerning more serious pursuits. The diary with which the volume begins includes the meetings of the Royal Geographical Society and of the British Association among scientific societies, and the anniversary dinner of the Royal Society. Though it is sometimes a little difficult to understand the principle of selection for the contents of the volume, we notice the activities of the Royal Institution, the Royal Society of Arts, and the Zoological Society are described.

LETTERS TO THE EDITOR.

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of* NATURE. *No notice is taken of anonymous communications.*]

A Kinetic Theory of Gravitation.

THE subject of Mr. Brush's article in NATURE of March 23 (p. 129) is certainly of profound interest, and will continue to be so until the problem as to the nature of gravitation is solved. Meanwhile, a few questions raised are comparatively simple. Anyone asked, Where lies the energy of a raised weight? must surely reply, "In the æther," *i.e.* in the medium, whatever it is, that is driving the weight down towards the earth. A critic who either doubts or asserts this will not be confused—as Mr. Brush suggests he will be—by the suggestion that the weight might be raised so high as to reach the neutral point between earth and moon—a suggestion which carries with it the tacit questions, "Where is the energy now?" and "What has become of the work done?"—for this case is no more troublesome than the case of a weight raised and hung on a hook. Something—some opposition force—sustains the weight, *i.e.* opposes the pull of the earth, and it matters little whether the opponent be a shelf beneath it or the moon above it. The important thing to understand is the nature of the downward propelling force—indeed, of both the upward and the downward force—in either case.

The question whether the energy of a raised weight is potential or kinetic is of little or no importance. The energy is certainly potential, according to our definition of potential. So is the energy of a strained spring: for there also the atoms are separated against their mutual (cohesive) attraction, and there again the energy really resides in the æther. But that all energy may turn out to be ultimately kinetic—when we come to understand what elastic stress fundamentally is—that proposition is not negatived in the least.

Mr. Brush proposes a shadow theory of gravitation, a modification of Le Sage's theory except that the pressure is supposed due to the non-syntonic impact of waves travelling in all directions, instead of to a bombardment of utterly minute particles flying at random. There is nothing new in a shadow theory, and all such theories are faced with the difficulty of plausibly explaining the absence of noticeable screening—a difficulty which is bound to reduce them to acquiescence in an approximation.

The contribution which Mr. Brush makes to the discussion is the suggestion that the supposed gravitational æther-waves are the result of accumulated thermal radiation from all past and present suns, the wave-lengths having automatically increased during their long storage.

To this view several objections might be urged—one of them being that in that case the constant of gravitation would be secularly increasing; another, that it should be greater in a hot enclosure, say the interior of a sun, than elsewhere; but a more salient obstacle is raised by the inquiry as to which is cause and which is effect. How did the bodies get hot and so radiate? Was not their heat perhaps due to their having clashed together with gravitational energy itself derived from the æther?

The fact is that every question concerning *origin* involves us always in insuperable puzzles, and that is just the main difficulty about gravitation. An atom of matter, by its very existence, sets up a fixed stress in the æther, varying directly as the mass and inversely as the distance—that is only another way of stating the law of gravitation; we are trying to understand the nature and cause of that stress. It appears to be one of the fundamental properties of matter, and until we can understand what is meant by the generation or destruction of an atom—*i.e.* of an electron if that is the fundamental unit—we are hardly likely to understand its gravitational influence more than any other of its fundamental properties—including, perhaps, existence itself.

Let this not be understood as a negative prediction or estimate of impossibility—such predictions are always absurd; it may be that when the structure of an electron